

# A Compact, Light-weight, Reliable and Highly Efficient Heat Pump for, Phase I

Completed Technology Project (2004 - 2005)



## Project Introduction

RTI proposes to develop an efficient, reliable, compact and lightweight heat pump for space applications. The proposed effort is expected to lead to (at the end of Phase II) a microclimate system that can remove 300 Watts of heat (in the cooling mode) requiring 92 Watts of electrical power. In the heating mode, the same system would provide up to 392 Watts of heat. The system is expected to weigh around 3.5 pounds (not including the power source) within a volume of about 1000 cc or 1 L. The design is based on a recently developed portable cooler for the Army. The performance of this system cannot be matched simply by using smaller versions of conventional designs, and is accomplished with recent advances in miniaturization and MEMS. Key technological innovations include use of a Wankel compressor with solid lubricants, system configuration for compact design, and design of condenser and evaporator for microgravity application. Phase I effort will concentrate on thermodynamic cycle, compressor, and solid lubrication. Design of the rest of the system, components and system testing and system integration would be undertaken in Phase II.

## Anticipated Benefits

Potential NASA Commercial Applications: The heat pump can also be useful to the Air Force for usage by flight-line maintenance and aircrew personnel, to the Army for dismounted soldiers as part of the Objective Force Warrior systems, and to fire departments across the country for usage by emergency and NBC cleanup personnel. The proposed system while used as a cooling unit has also immense commercial applications in cooling of computer chips/boards/systems and medical applications for patients with illnesses such as multiple sclerosis.



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## Organizational Responsibility

### Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

### Lead Center / Facility:

Johnson Space Center (JSC)

### Responsible Program:

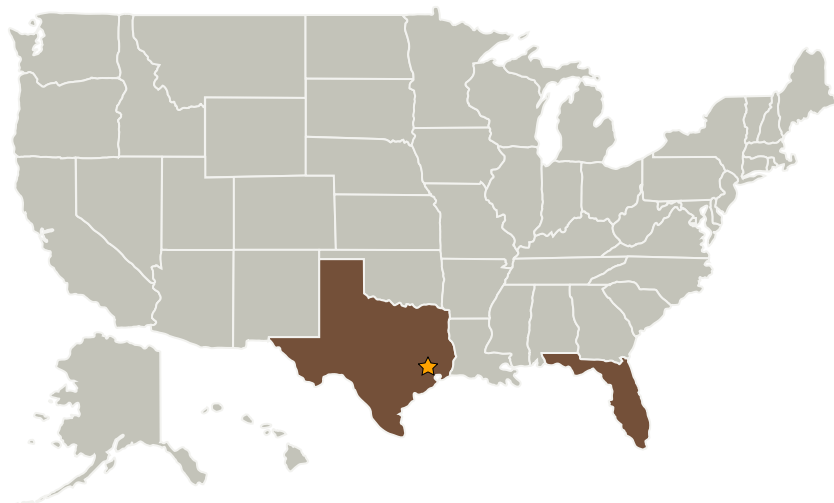
Small Business Innovation Research/Small Business Tech Transfer

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## Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★ Johnson Space Center(JSC)	Lead Organization	NASA Center	Houston, Texas
Rini Technologies, Inc.	Supporting Organization	Industry	Orlando, Florida
University of Central Florida(UCF)	Supporting Organization	Academia	Orlando, Florida

## Project Management

### Program Director:

Jason L Kessler

### Program Manager:

Carlos Torrez

### Principal Investigator:

Daniel Rini

## Technology Areas

### Primary:

- TX14 Thermal Management Systems
  - ↳ TX14.2 Thermal Control Components and Systems
    - ↳ TX14.2.3 Heat Rejection and Storage

## Primary U.S. Work Locations

Florida	Texas
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